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The GOES-R AWG Fog/Low Cloud Product

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Outline

- Definition of Fog/Low Cloud
- Introduction to the GOES-R AWG Fog Product
- Known Limitations
- Examples
- PG Plans

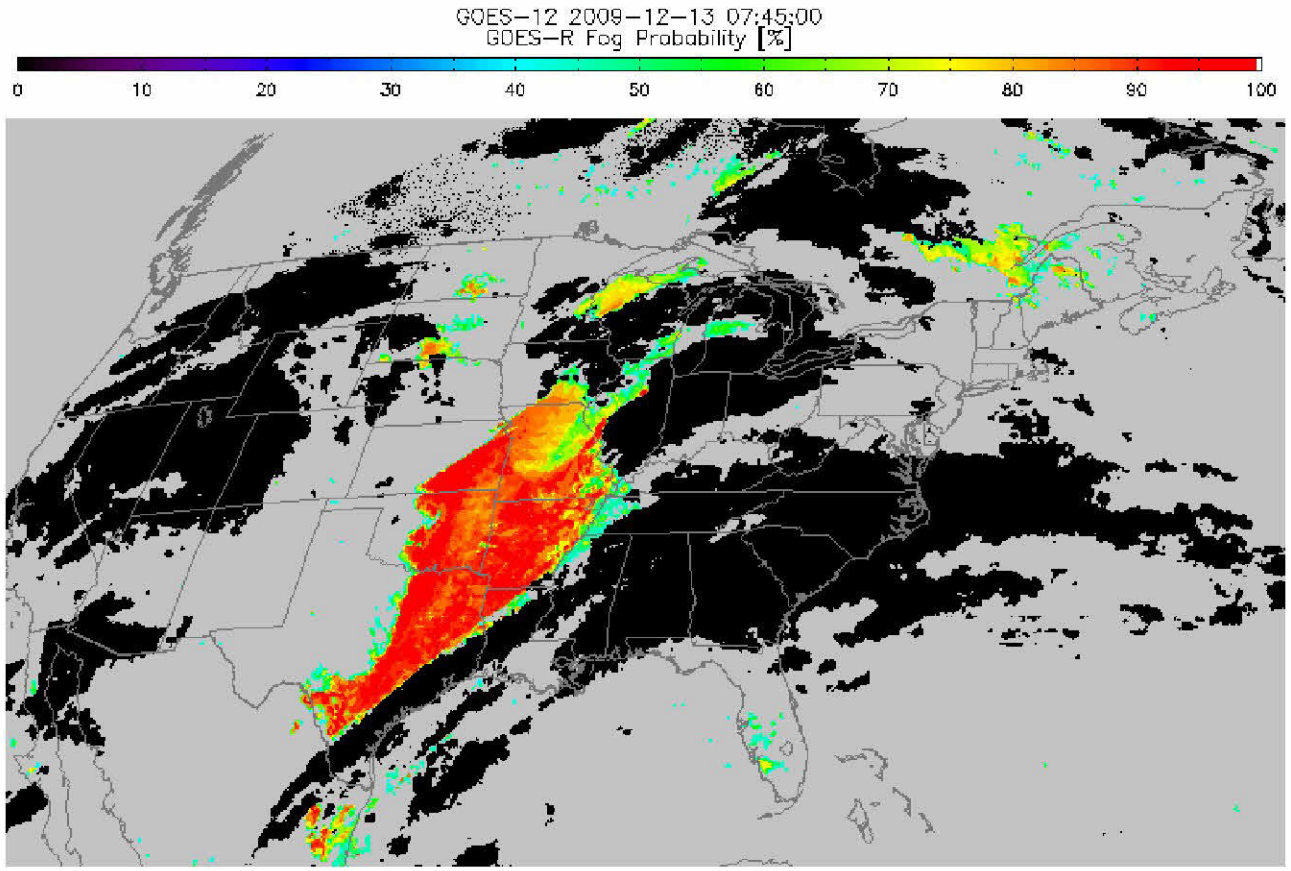
What Is Fog?

- **Aviation based fog/low cloud definition**
  - Visual flight rules - ceiling > 3000 ft (914 m)
  - Marginal visual flight rules 1000 ft (305 m) < ceiling < 3000 ft (914 m)
  - Instrument flight rules - 500 ft (152 m) < ceiling < 1000 ft (305 m)
  - Low instrument flight rules - ceiling < 500 ft (152 m)

Given the above definition, our aim is to identify clouds that have a ceiling lower than ~300 meters (instrument flight rules).

GOES-R AWG Fog Detection Product

- **The fog detection algorithm, developed by the GOES-R algorithm working group, uses spectral, textual, and temporal information to determine fog probability at all times of the day.**
- **We are on track to meet the 70% correct detection accuracy specification.**



Primary Limitations

- Passive sensor based algorithms can only detect fog when fog is the highest cloud layer.
- Not every surface observation underneath a GOES-R detected low cloud will necessarily indicate a ceiling of 1000 ft or lower, but those surface observations that do not indicate LIFR or IFR will generally indicate Marginal Visual Flight Rules (MVFR) conditions.
- The methodology used to detect fog in the day/night terminator is still under development.

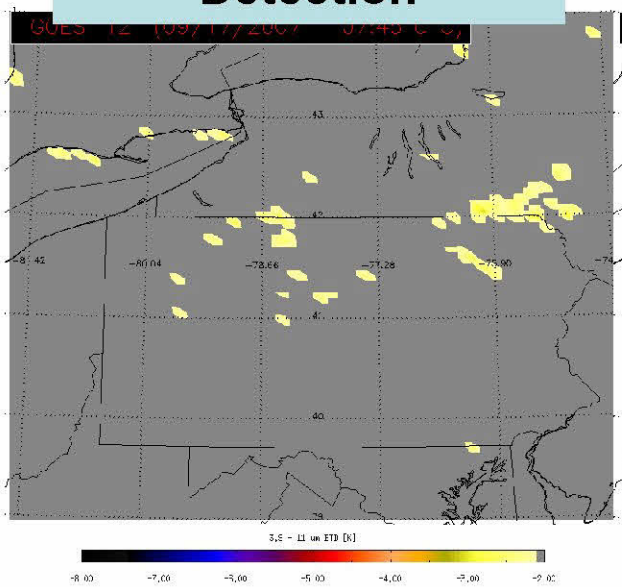
GOES-R Fog Detection

The GOES-R fog detection product will significantly improve geostationary satellite fog monitoring capabilities because:

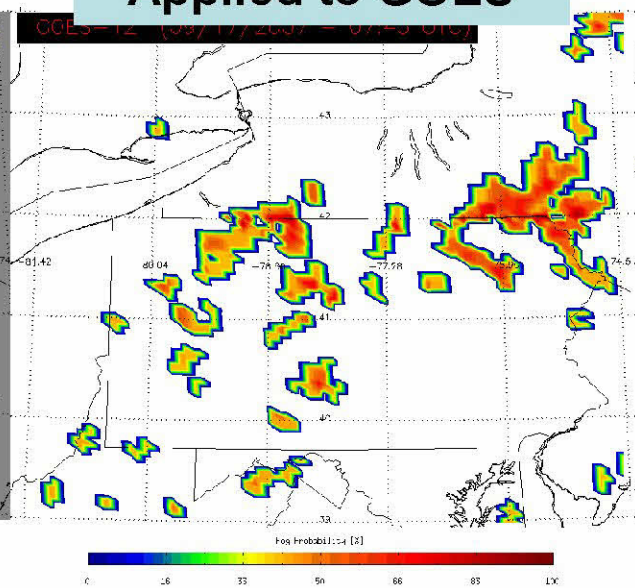
- ***Improved algorithm technology*** - the GOES-R algorithm provides quantitative information on fog probability, while heritage GOES fog detection products are more qualitative in nature

- ***Improved sensor technology*** - the ABI has greatly improved spectral information, spatial resolution, and temporal resolution

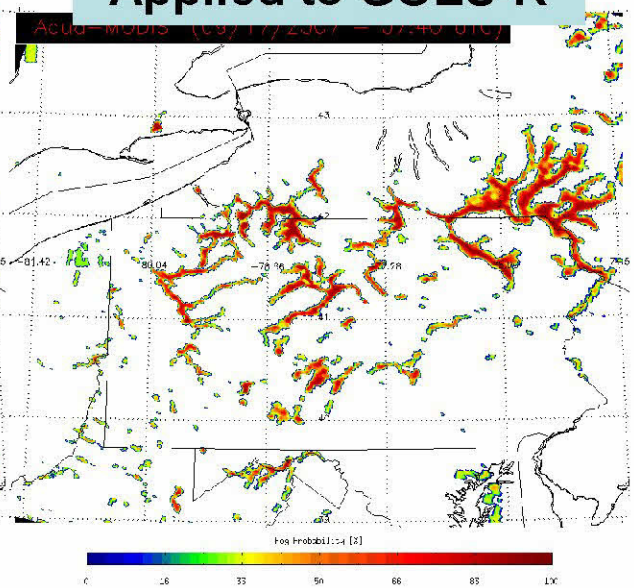
Heritage GOES Fog Detection



GOES-R Algorithm Applied to GOES

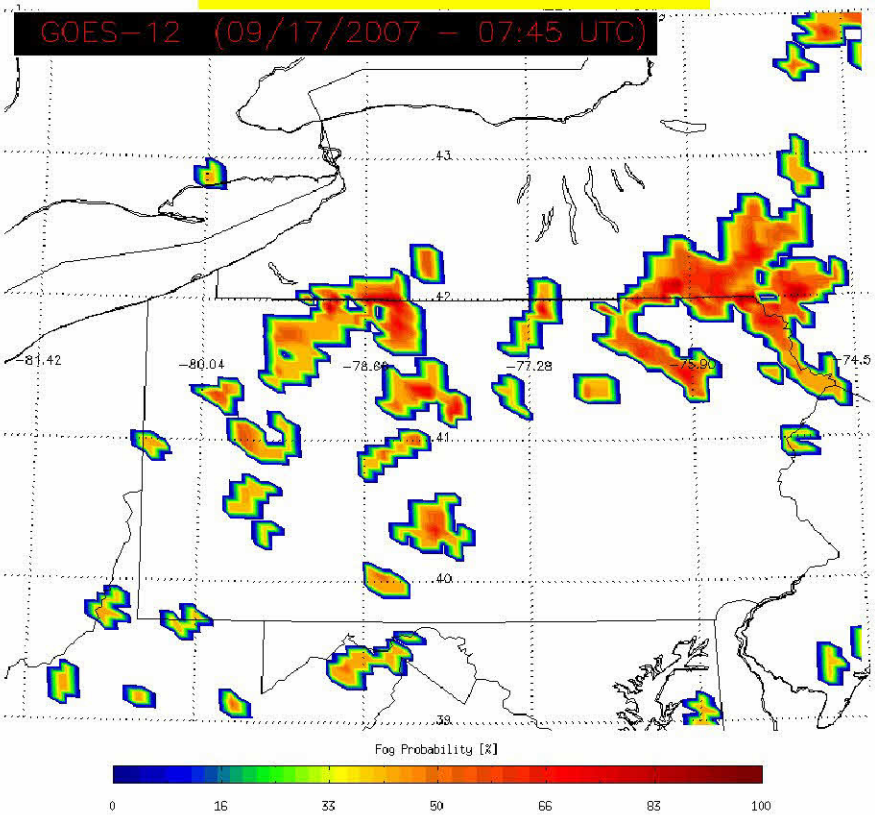


GOES-R Algorithm Applied to GOES-R

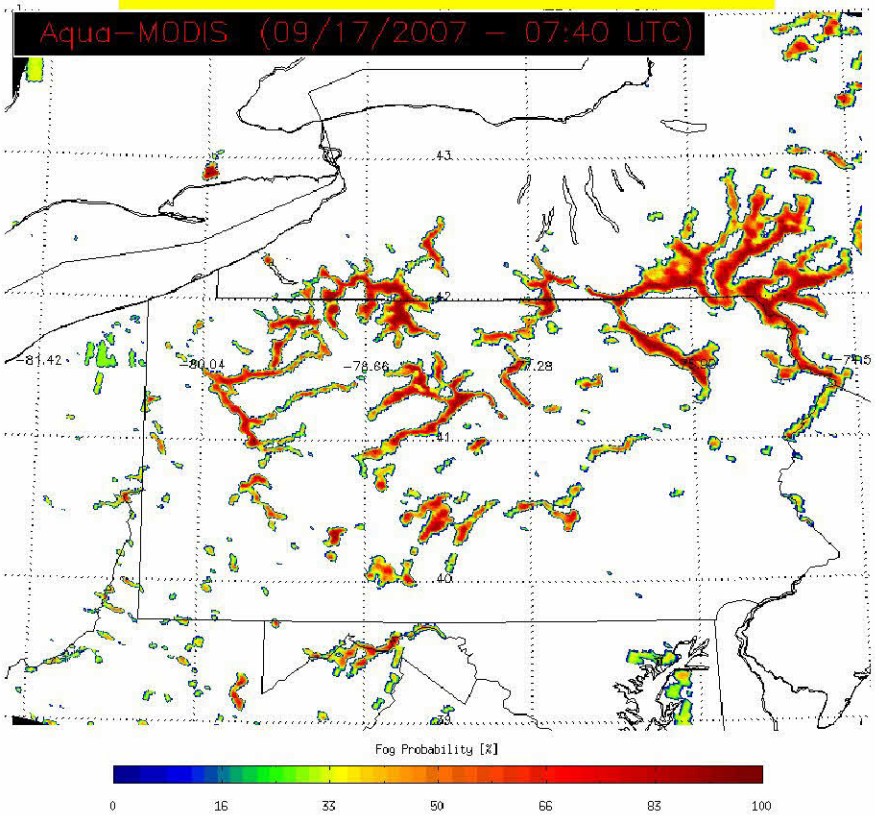


The GOES-R fog product can much more accurately capture valley fog events like this one on the east coast of the U.S., compared to current GOES

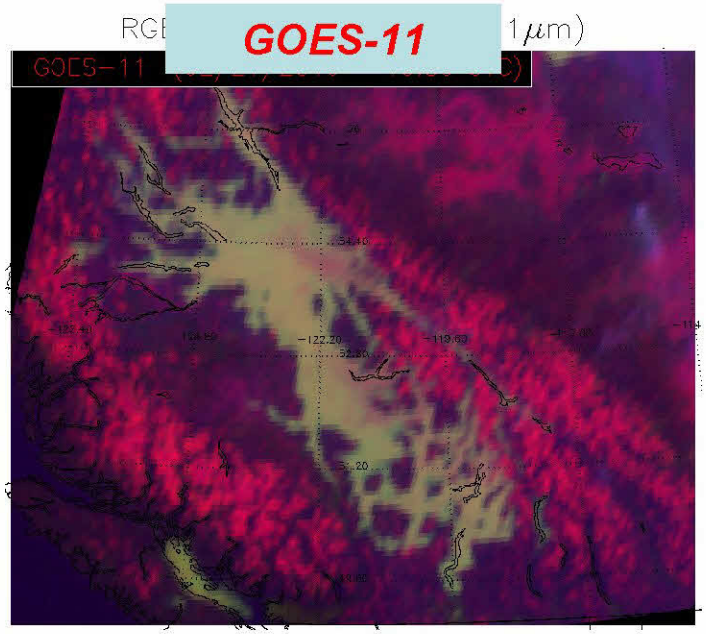
GOES

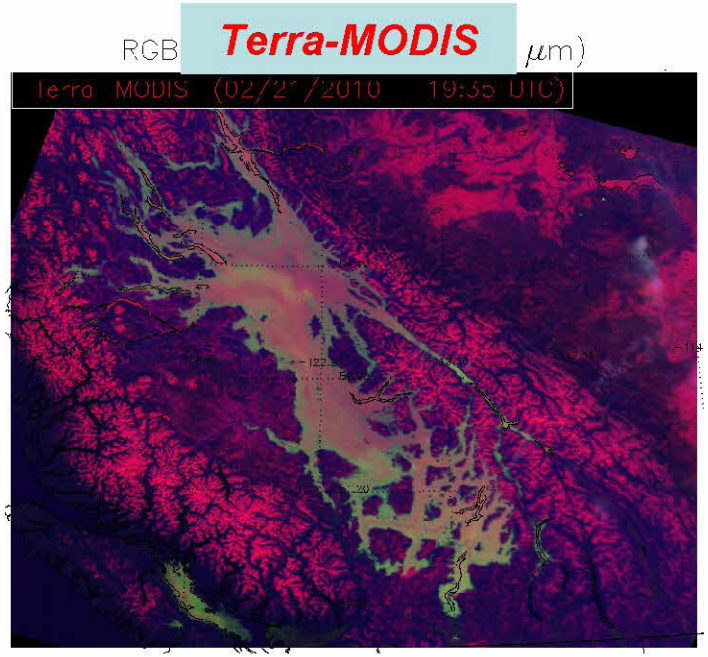


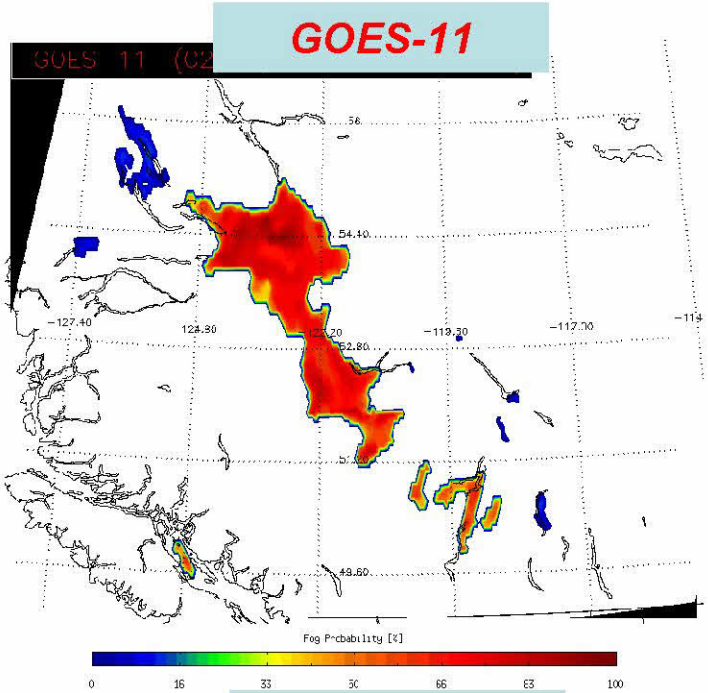
GOES-R

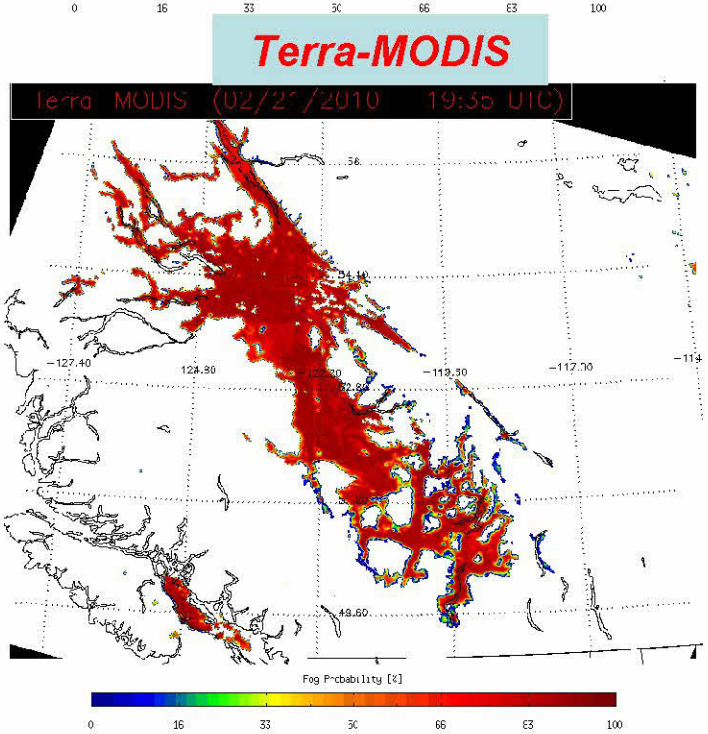


February 21, 2010 (19:35 UTC)

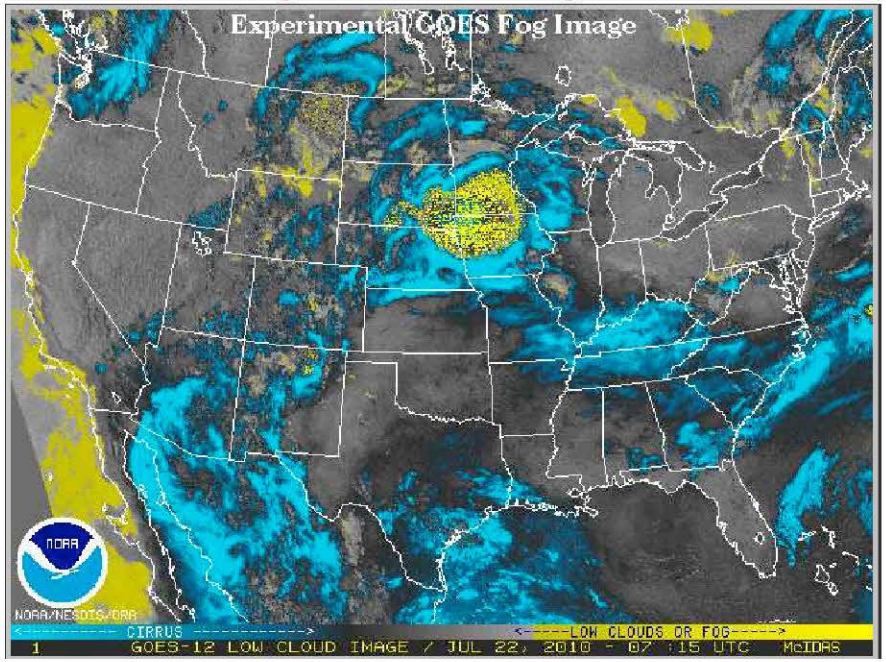






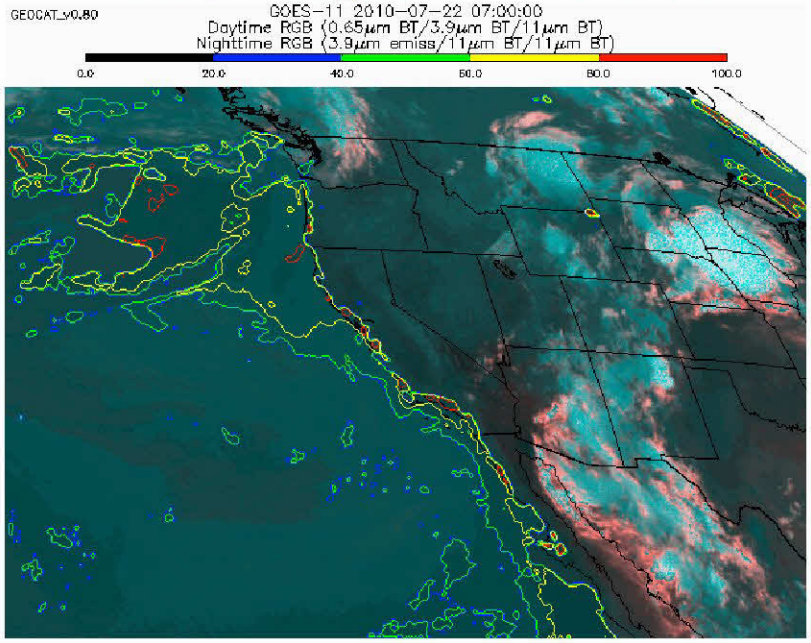


Heritage NESDIS Fog Product

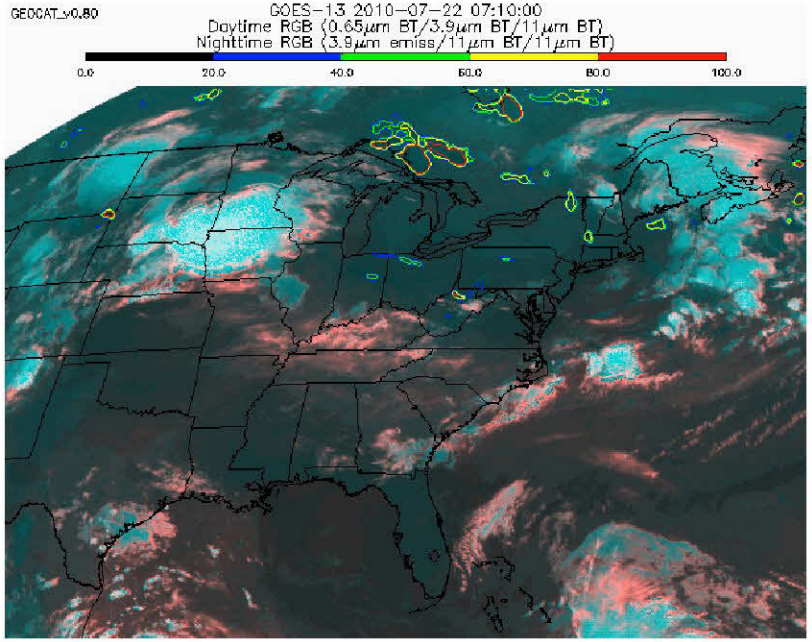


We routinely compare the GOES-R fog detection capabilities to the heritage NESDIS fog detection capabilities

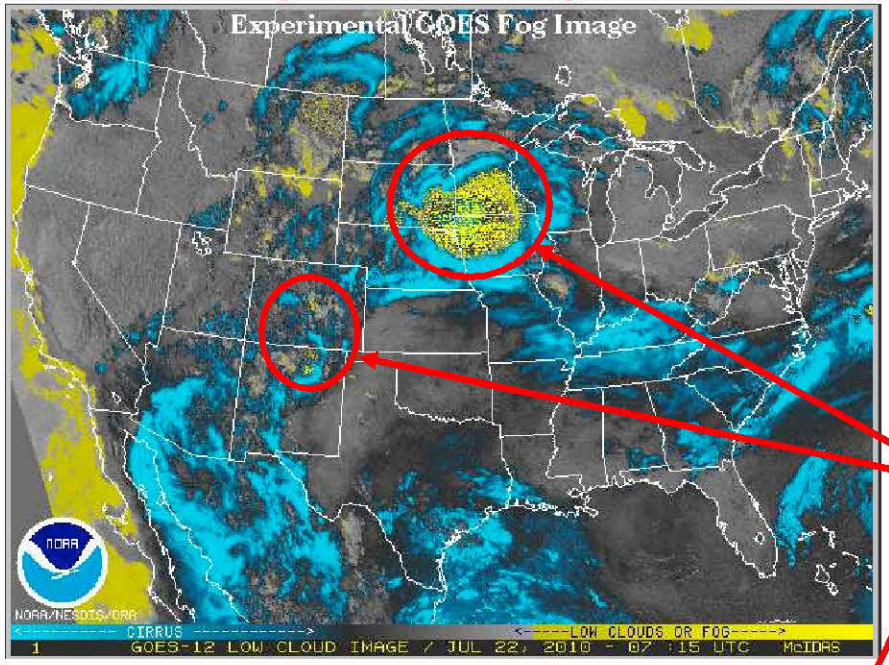
GOES-R Algorithm - GOES-W



GOES-R Algorithm - GOES-E

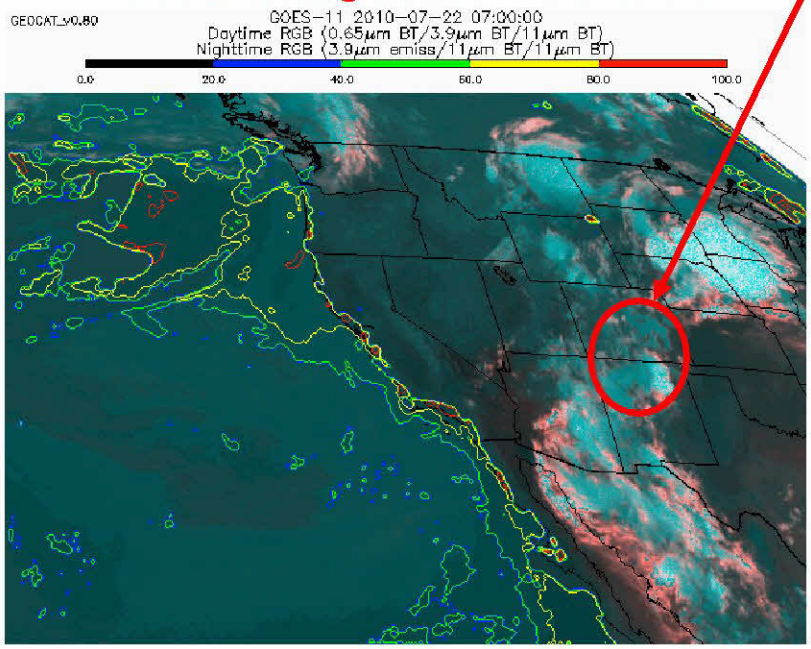


Heritage NESDIS Fog Product

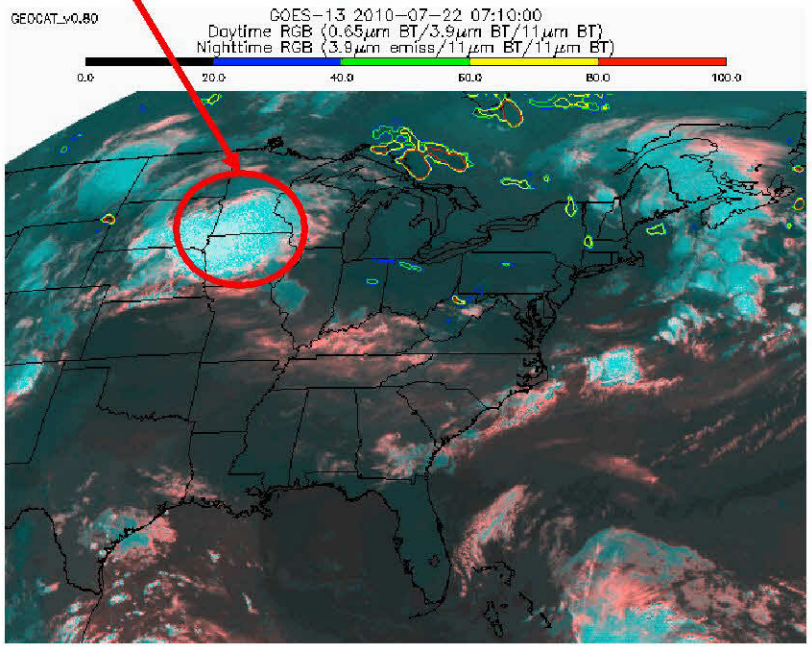


The GOES-R approach eliminates many false signals, such as though from deep convection and non-fog liquid water clouds.

GOES-R Algorithm - GOES-W



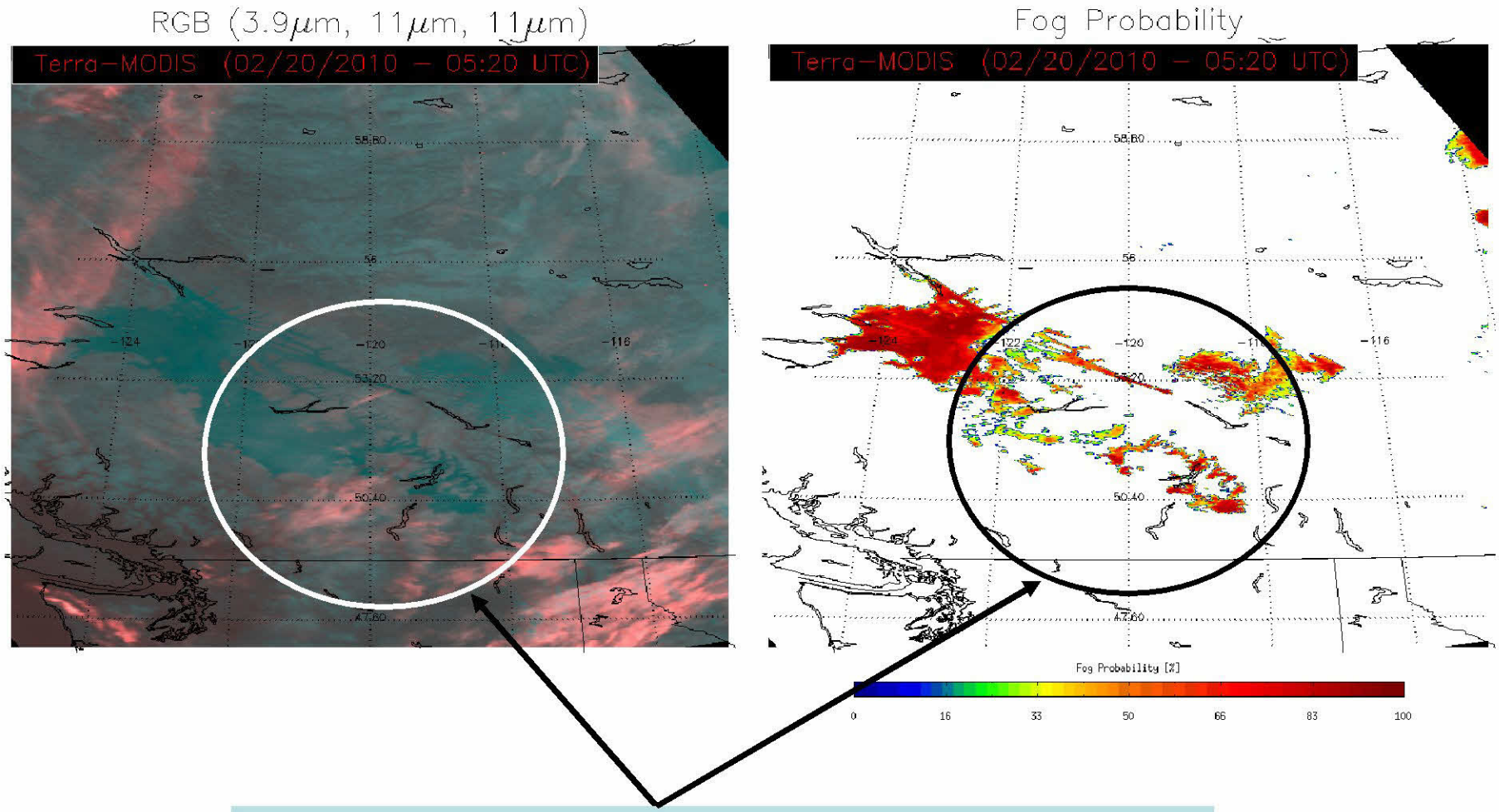
GOES-R Algorithm - GOES-E



QuickTime™ and a
decompressor
are needed to see this picture.

We are still working on the procedure to consistently detect fog in the day/night terminator.

Impact of Overlapping Cirrus



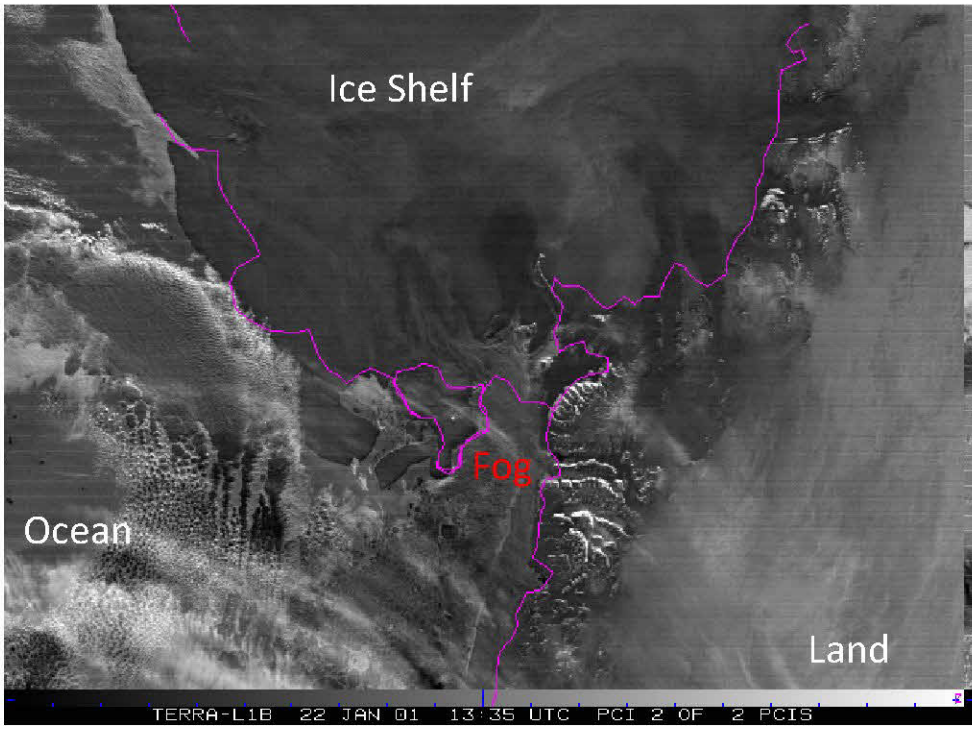
Overlapping thin cirrus prevent the detection fog underlying fog

QuickTime™ and a
decompressor
are needed to see this picture.

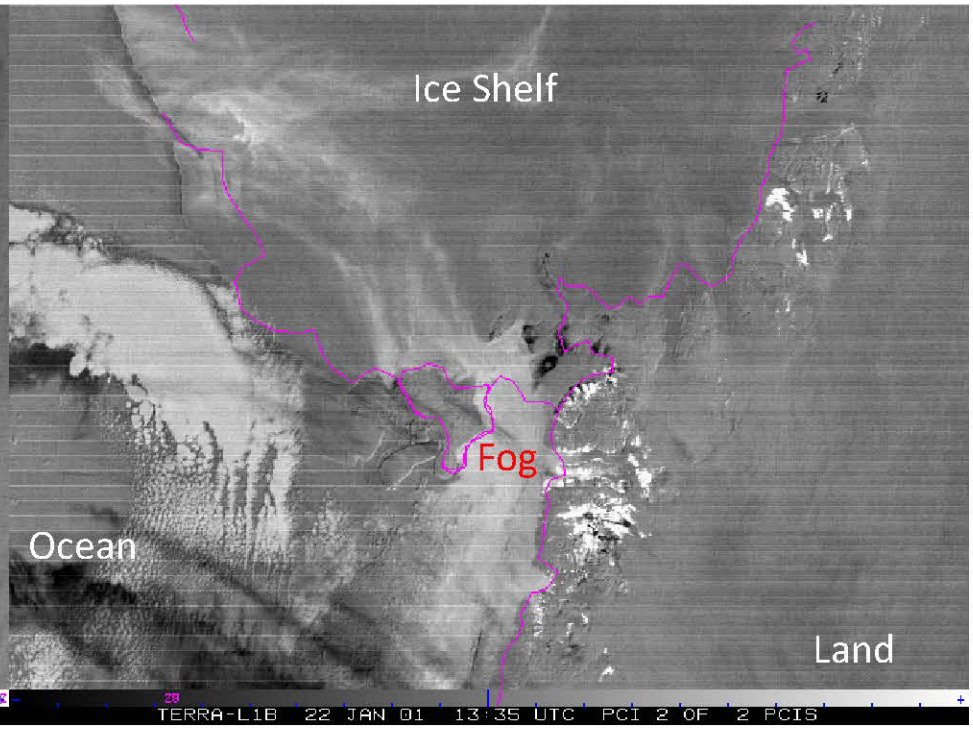
Using 8.5 µm for fog/stratus at high latitudes and/or cold scenes

(Based on MSG fog/low stratus product; as noted in GOES-R 101 training module)

(MODIS example over Antarctica provided by M. Lazzara, CIMSS;
fog reports from Automatic Weather Station network)



3.9 µm / 11. µm difference: Whereas this difference is normally effective for fog/stratus detection, the low sun angles in this Antarctic summer image mask the fog feature.



8.5 µm / 11. µm difference: This difference appears to show the fog, because of lower albedo of mixed-phase clouds, covering a larger area than where fog reports are primarily available.

Don Hillger, RAMMB/STAR, CIRA Proving Ground

Current PG Plans

- The GOES-R fog product (from MODIS and GOES) will be evaluated at the NWS in Alaska and the Aviation Weather Center this fall.

- We are currently working on AWIPS and NAWIPS product visualization.